

# FCC Spectrum Activities at the FCC/OET



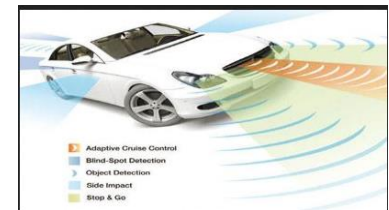
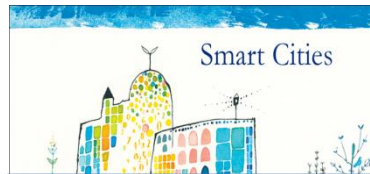
Julius Knapp, Chief  
Office of Engineering and Technology  
Federal Communications Commission

National Spectrum  
Management Association  
May 15, 2018

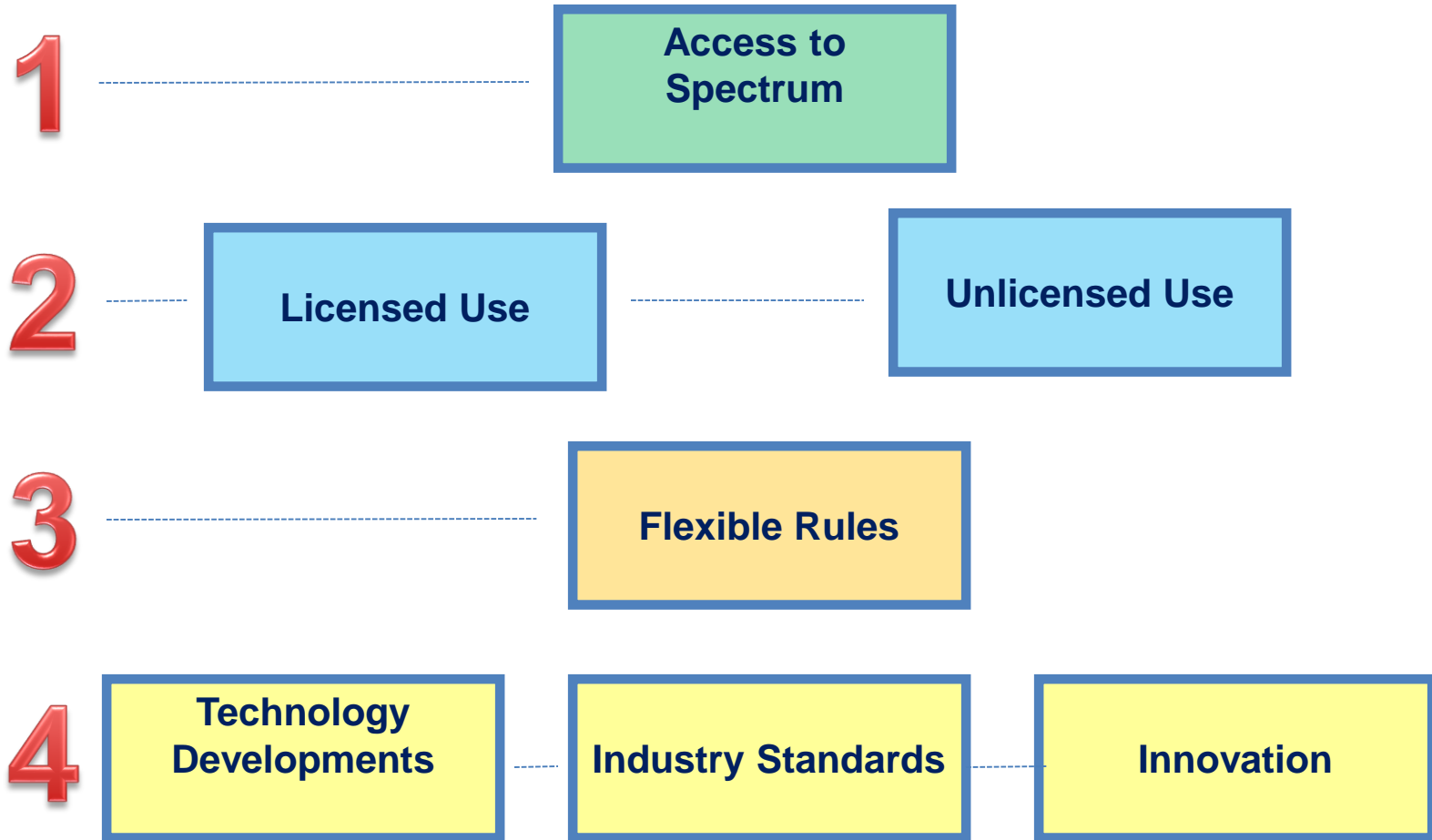
Note: The views expressed in this presentation are those of the author and may not necessarily represent the views of the Federal Communications Commission

# The Everything Wireless World

Demand for Access to Spectrum Continues to Grow



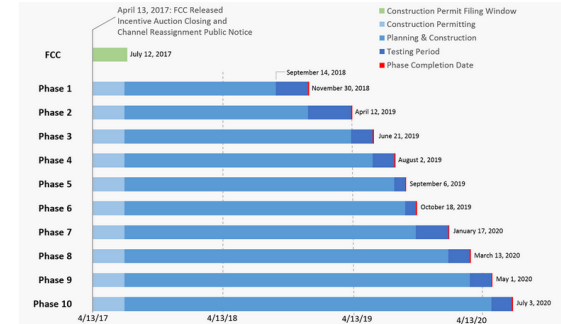
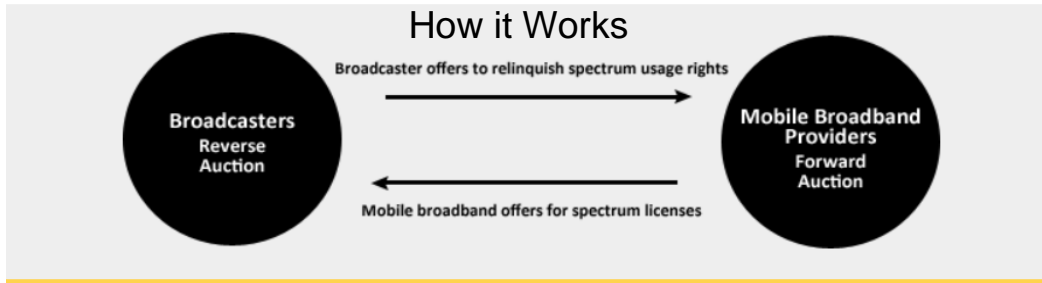
# How This All Came About: It's As Simple as 1, 2, 3 . . . 4



# Key FCC Spectrum Initiatives & Proceedings

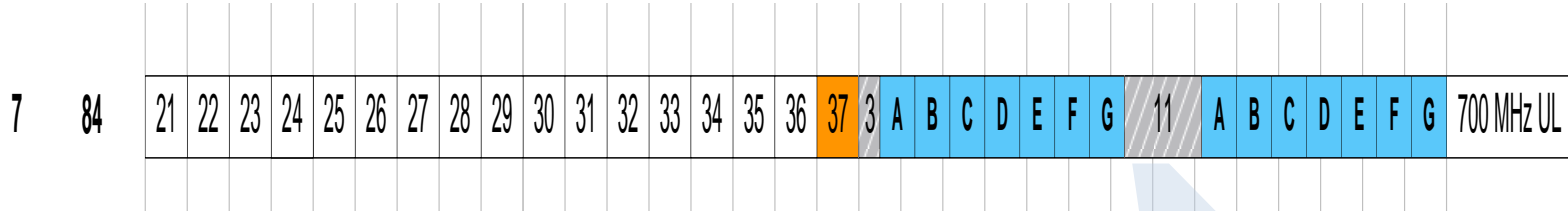
- **Low Frequency Spectrum:**
  - Broadcast Incentive Auction (600 MHz band)
- **Mid Frequency Spectrum:**
  - 3.5 GHz (3550-3700 MHz)
  - Mid-Band Spectrum Notice of Inquiry (3.7 GHz to 24 GHz)
- **High Frequency Spectrum:**
  - Spectrum Frontiers (above 24 GHz)
  - Spectrum Horizons (above 95 GHz)

# Low Band: TV Incentive Auction (600 MHz) band

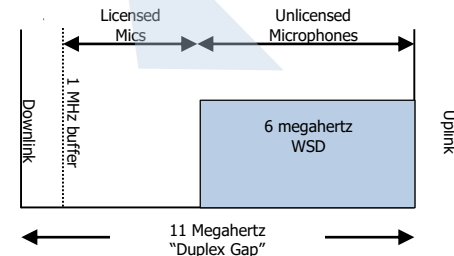


Ten Phase Transition Plan

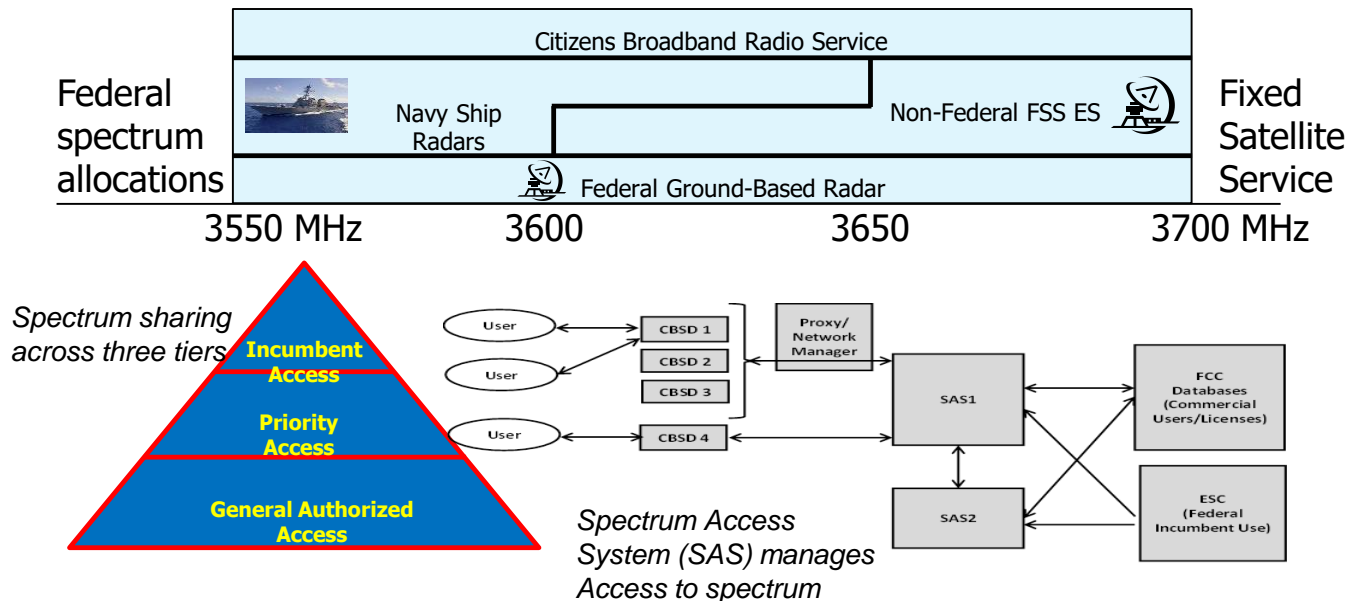
- Reverse Auction
  - Ended January 13, 2017 – Stage 4; 84 megahertz clearing target



- Forward Auction Ended 2/10/17
- 39 month transition period began 4/13/17
- First licenses were issued 6/15/17
- Post-Incentive Auction Special Displacement Window 4/10/18 – 6/1/18



# Mid Band Citizen's Broadband Radio Service (3.5 GHz)



## Where We Are In The Process

- Conditionally approved first Spectrum Access Administrators: Amdocs, Inc.; Comsearch, CTIA – The Wireless Association, Federated Wireless, Google, Inc.; Key Bridge; and Sony Electronics, Inc.
- WinnForum Multi-stakeholder process developing implementation details (working with NTIA & DoD)
- WinnForum completed ten standards comprising the baseline specifications for commercial operations within the 3.5 GHz Citizens Broadband Radio Service (CBRS) band - - allows the finalization of CBRS products already in various levels of testing and sets the stage for the rollout of commercial CBRS networks
- NTIA Institute for Telecommunications Standards to perform SAS testing

# Mid Band Notice of Inquiry

- Sought comment on potential opportunities for flexible use in bands between 3.7 and 24 GHz
- Asked detailed questions about three specific mid-range bands: 3.7-4.2 GHz; 5.925-6.425 GHz; and, 6.425-7.125 GHz
- Asked commenters to identify other mid-range bands that might be suitable candidates for expanded flexible wireless use
- **Significance:** 3.7 GHz is adjacent to 3.5 GHz band; 6-8 GHz is close to 5 GHz unlicensed bands

## Two Areas of Focus:

3.7 – 4.2 GHz – Licensed access to C-band satellite DL spectrum?



6 – 8 GHz – Unlicensed sharing with Pt-2-Pt microwave & satellite uplinks?



# High Band Spectrum Frontiers

## Spectrum Allocations

### 12.55 GHz of Spectrum added for mobile

- **Licensed Bands (Total 3.85 GHz):**  
24.25-24.45 GHz and 24.75-25.25 GHz; 47.2-48.2 GHz; 27.5-28.35 GHz; 37-38.6 GHz; 38.6-40 GHz;
- **Unlicensed Bands (Total 7 GHz):**  
64-71 GHz

## Service Rules

- Part 30: Upper Microwave Flexible Use Service (UMFUS)
- Geographic Area Licensing, Area Size, Band Plan, License Term, Overlay Auctions
- Technical rules
- Performance Requirements

Often Associated with “5G” – but 5G is not band specific



# Overview of First Report and Order Bands

	28 GHz	37 GHz	39 GHz	64-71 GHz
<i>Frequency</i>	27.5-28.35 GHz	37-38.6 GHz	38.6-40 GHz	64-71 GHz
<i>Bandwidth</i>	850 MHz	1600 MHz	1400 MHz	7000 MHz
<i>Terrestrial Allocation</i>	Licensed for fixed operations, with about 75% of the population covered by existing licenses; remaining licenses in inventory	Yes (no current use)	Licensed for fixed operations, with about 50% of the population covered by existing licenses; the remaining licenses are in inventory.	Yes (no current use)
<i>Federal Allocation</i>	No	Radio Astronomy / Space Research in 37-38 GHz @ 3 sites;  Federal Fixed/Mobile in 37-38.6 GHz @ 14 locations	Fixed Satellite Service / Mobile Satellite Service in 39.5-40 (military use only)	Earth Exploration Satellite  Fixed/Mobile/Satellite
<i>Satellite Allocation</i>	Yes	Yes (no current use)	Yes (no current use)	Yes (no current use)
<i>Licensing Scheme</i>	Licensed	Licensed	Licensed	Unlicensed

Satellite/terrestrial sharing accomplished by well defined protections & rights

Lower 600 MHz identified for sharing between Federal Government and Private Sector - - invited comment on sharing method



# Overview of Second R&O Bands

	24 GHz	47 GHz
<i>Frequency</i>	24.25-24.45 GHz and 24.75-25.25 GHz	47.2-48.2 GHz
<i>Bandwidth</i>	700 MHz	1000 MHz
<i>Terrestrial Allocation</i>	Lower segment is licensed for two types of fixed operations: 24 GHz service and Digital Electronic Messaging Service (DEMS). 5 active 24 GHz licenses, and 38 active DEMS licenses; remaining licenses in inventory	Yes (no current use)
<i>Federal Allocation</i>	No	No
<i>Satellite Allocation</i>	Yes, 24.75-25.25 GHz band segment is non-Federal allocated for FSS (Earth-to-space)	Yes (no current use and the Commission designated this band for terrestrial use)
<i>Licensing Scheme</i>	Licensed	Licensed

# Spectrum Horizons

(ET Docket No. 18-21; RM-11713; WT Docket No. 15-245; RM-11795 )

- **Proposed to expand access above 95 GHz**
  - **Total of 102.2 GHz to for licensed point-to-point services**
    - Similar to 70/80/90 GHz rules
    - Licensed nationwide, non-exclusive basis
    - Register links with database manager
    - Seek comment on mobile use
  - **Total of 15.2 GHz for unlicensed use**
    - Similar to 60 GHz rules
    - Selected high absorption bands
  - **New type of experimental licenses > 95 GHz**
    - Longer license terms
    - Ability to sell devices

Much of the spectrum above 95 GHz is allocated for passive services



Achieve Fiber Capacity

Innovations

# Encouraging the Provision of New Technologies and Services to the Public

(GN Docket No. 18-22)

- Proposal to implement **Section 7** of the Communications Act

## Section 7 - New Technologies and Services

(a) It shall be the policy of the United States to encourage the provision of new technologies and services to the public. Any person or party (other than the Commission) who opposes a new technology or service proposed to be permitted under this Act shall have the burden to demonstrate that such proposal is inconsistent with the public interest.

(b) The Commission shall determine whether any new technology or service proposed in a petition or application is in the public interest within one year after such petition or application is filed. If the Commission initiates its own proceeding for a new technology or service, such proceeding shall be completed within 12 months after it is initiated.

- Proposed process for reviewing Section 7 requests and timeline for actions
- Invited broad comment

# Other Spectrum Activities

- 5.9 GHz Unlicensed & Testing (ET Docket No. 13-49)
- TV White Space (ET Docket No. 14-165)
- NPRM on Streamlining Licensing Procedures for Small Satellites (IB Docket No. 18-86)
- Sixth Further NPRM on 4.9 GHz (WP Docket No. 07-100)
- NOI to Review of the Commission's Rules Governing the 896-901/935-940 MHz Band to Create a Private Enterprise Broadband Allocation (WT Docket No. 17-200)

# Omnibus Appropriations Act

Public Law 115-141 (Enacted 3.23.2018)

AKA Ray Baum Act

(Repack Airwaves Yielding Better Access for Users of Modern Services Act of 2018)

- Contains numerous provisions for actions and reports by FCC, NTIA, et al re spectrum:
  - Identify at least 255 MHz of spectrum for mobile and fixed wireless BB use (100 MHz below 8 GHz for unlicensed use; 100 MHz below 6 GHz for flexible licensed use; 55 MHz below 8 GHz for licensed/unlicensed or both use) by 12/31/2022
  - NTIA feasibility report on commercial wireless use in 3100 - 3550 MHz band by 3/23/20
  - FCC feasibility report on commercial wireless use in 3700-4200 MHz band by 9/23/19
  - Publish NPRM to authorize mobile or fixed use in 42-42.5 GHz band.
  - NTIA report on recommendations to incentivize Federal entities to give up or share spectrum
  - Collaborate w/ NTIA to conduct bidirectional sharing study by 9/23/19
  - Develop national plan by 9/23/19 to make add'l spectrum available for unlicensed or licensed use
  - Adopt rules to permit unlicensed use in guard bands (including duplex gaps)
  - Ensure FCC efforts related to unlicensed use policies are reasonable and in the public interest
- And many provisions on other topics

# FCC Technological Advisory Council

## Topics for 2018

- 5G and the Internet of Things
- Mobile Device Theft Prevention
- Antenna Technology
- Communication Strategy for Drones
- Future of Power
- Computational Power and Stress on the Networks

# Update on Experimental Program License Program

- In April 2017 OET Implemented New Experimental License Program:
  - Recognizes that many R&D institutions control the space within which experiments occur - - Campuses, test ranges, etc.
  - Risk of interference is minimized within such controlled spaces
- Program License:
  - Grants general authority to conduct experiments in defined geographic area
  - Must describe experiment & post on FCC program license website
  - Website permits inspection by public and automatic notification by triggers on experiment characteristics to interested parties
  - If no objections received within 10 day period (15 federal frequencies), applicant is authorized to proceed
  - Report on experiment including any interference incidents must be posted on website within 30 days of experiment termination

**We have since granted more than 60 experimental program licenses**



# Milestones in Progress of Dynamic Spectrum Access

- Unlicensed PCS (etiquette)
- Medical Implants

Early 1990's

- Software Defined Radios
- Wi-Fi & Bluetooth

Late 1990's

- Dynamic Frequency Selection
- TV White Space & Cognitive Radio

2000's

- Citizen's Broadband Radio Service

2010's

New Opportunities

The Future

## Game Changers

- SDR: Frequency agility
- Data bases & cognitive radio
- Internet: Ability to connect to & manage devices

## Future Game Changers

- Prove benefits = buy-in
- Artificial intelligence
- Interference management

**Thank You!**